

Early Rehabilitation Care for Patients with Traumatic Brain Injury: A Concept Analysis Study

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Received July 14, 2020; Accepted August 17, 2020; Online Published September 01, 2020

Abstract

Background: Availability and efficiency of early rehabilitation care are crucial for the restoration and improvement of brain function. Moreover, it can help increase the possibility of the patient's successful future integration in the community. However, there is no clear and general consensus on this concept (regarding patients with traumatic brain injury) and it is considered a poorly developed area of research.

Objectives: The purpose of this study was to analyze the concept of early rehabilitation care in patients with traumatic brain injury (TBI).

Methods: Walker and Avant's (2011) approach was employed to analyze this concept. Various databases and search engines were explored to find all the relevant data regarding the concept of early rehabilitation care from 1990 to 2020. Finally, the definition, usage, features, antecedents, attribute, consequences, and empirical referents on the subject of early rehabilitation care were extracted.

Results: The results of the concept analysis demonstrated that the most important features of early rehabilitation care include early specialized comprehensive care, purposeful and patient-centered care, and teamwork. Hence, the objectives include decreasing the bad consequence caused by immobility, contracture, bladder and intestinal dysfunction, pressure ulcer, and sleeping disorders.

Conclusion: It is believed that the concept of early rehabilitation care is not fully established in the literature in patients with traumatic brain injury, and there are only rudimentary ideas and steps toward applying this concept. Therefore, clarifications on this concept can pave the way for further application of early rehabilitation care.

Keywords: Early Rehabilitation Care, Concept Analysis, Traumatic Brain Injury.

Introduction

Traumatic brain injury (TBI) is defined as any alteration in function or other brain pathology due to an external force.¹ TBI is a serious public health problem that involves both the youth and the elderly in the US community as well as the world.² It is considered the major cause of disability and death among the young population of high-income countries. As a result of the increasing use of motorcycles among low- and middle-income countries, the prevalence of TBI has become a growing concern around the world.^{3,4}

According to the World Health Organization (WHO) reports, road traffic accidents are the third most important cause of mortality and injury burden in the world.⁵

Most of the TBI hospitalized patients are young adults and the most prevalent reasons include road traffic injuries (RTI)

(42%) and falling (46%). TBI causes long-term physical, cognitive and emotional problems, which significantly increase health-related costs.⁶

The patients diagnosed with TBI need constant and costly treatments including specific rehabilitation care.⁷ Besides, moderate and severe brain injuries require rehabilitation intervention. Rehabilitation interventions in the TBI patients can lead to the reduction of the disability, improving the quality of life and functional outcomes.⁸

The rehabilitation process for the patients diagnosed with TBI includes three phases: early rehabilitation from the moment of the incident and in level-I local trauma hospitals to the beginning of the professional rehabilitation; professional rehabilitation during the sub-acute phase; and community-based rehabilitation in the third phase.^{9,10}

Early, constant and efficient rehabilitation care is necessary to maintain or improve brain function, improve the life quality of the patients, and make the patients ready to return to the Activities of Daily Living (ADL), community and workplace. Besides, it can lead to better recovery, reduction of treatment costs, and shorter hospital length of stay for the patients⁹. Any further participation in activities as well as regaining brain function and quality of life for those patients requires an early, inter-disciplinary, and specialized rehabilitation course.¹¹

Recently, early rehabilitation care has been increasingly applied for a variety of diseases like Stroke, Coronary Artery Bypass Surgery (CABG), Arthroplasty, and Lung Cancer.¹²⁻¹⁴ Much evidence shows that not only early and systematic rehabilitation can lead to lower in-hospital infections and the hospital length of stay, but also help improve long-term outcomes and prevent complications.¹⁵ There is still limited evidence about the concept and elements of early rehabilitation care in TBI. Moreover, there is also no consensus over its application. Furthermore, there is no generally accepted definition and classification for early rehabilitation care in TBI patients, and hence, a clear definition of such a concept could have positive effects on patients' care.

One of the most important methods of expanding knowledge is to develop and illustrate the concepts. Besides, there is a wide variety of methods of applying rehabilitation care within the TBI literature.¹⁶ Accordingly, early rehabilitation care in TBI patients is not clearly defined.

The present study aimed at the analysis of the concept of early rehabilitation care in patients with traumatic brain injury based on existing documents and resources. This may lead to proposing a clear, valid, and specific clarification regarding the features and dimensions of early rehabilitation care in TBI.

Materials and Methods

This qualitative concept analysis is a part of a grounded theory study. In this study, a specific type of concept analysis approach was used that can help elaborate, clarify, and distinguish one concept from the others. Therefore, the researchers used Walker and Avant's (2011) eight-step approach because it is one of the clearest, systematic, and prevalent approaches (Table 1).¹⁷ The core aim of concept analysis is to distinguish the features of a concept from other

concepts.¹⁸ This is especially applicable to new concepts and the concepts that are theoretical in nature.¹⁷ Therefore, this logical demonstrative approach can clarify a concept such as early rehabilitation care in TBI patients through empirical simplification, and it can also determine its features, antecedents, and consequences.¹⁹

Table-1. The eight steps of concept analysis Methodology with walker & Avant

The steps	Description of the steps
First	Selecting a concept
Second	determining the aims or purposes of analysis
Third	Identifying all uses of the concept that you can discovery
Fourth	Determining the defining attribute
Fifth	Identifying a model case
Sixth	Identifying borderline, related, contrary, invented, and illegitimate case
Seventh	Identifying antecedents and consequences
Eighth	Defining empirical referents

For this study, at first, the concept of early rehabilitation care was searched through various reliable databases such as PubMed, EMBASE, CINAHL, AMED, Psych INFO, Scopus, Web of Science, Scielo & LILACS, and ProQuest from 1990 to June 2020 based on some keywords like rehabilitation care, traumatic brain injury, acute rehabilitation, early rehabilitation, and inpatient rehabilitation.

According to the Walker and Avant's method, it is essential to include all the relevant and useful studies.¹⁷ Therefore, the following inclusion criteria were taken into account for the present study: a) all types of the research studies (quantitative, qualitative, systematic review, and mixed-method), b) diagnosis with TBI, c) receiving early rehabilitation care, d) 18 years of age or above, and e) publications in English languages. On the other hand, the researcher decided to observe the following exclusion criteria: a) studies which were not undergone peer review, b) studies on community-based rehabilitation or acute phase, c) non-TBI or spinal injury, and d) studies on the patients under 18 years of age (infants and children).

These keywords were looked up in the title, abstract, or keywords sections. The researchers selected the English articles for which the full texts were available; however, no concept analysis study pertinent to early rehabilitation in TBI was found. The reference lists of the selected articles were

reviewed as well. Having examined the selected articles and having obliterated the duplicated ones, the researchers decided to work on 30 articles regarding early rehabilitation care. In addition, English dictionaries, rehabilitation-based books, and rehabilitation guidelines were observed as well.

Ethical Statement

This study was approved by the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences, Tehran, Iran (no. IR.USWR.REC.1396.215)

Results

In the literature review, 30 articles, 4 books, and 4 clinical guidelines that were related to the topic were reviewed. The eight stages of the Walker and Avant's method for the analysis of the concept of "early rehabilitation care in TBI patient" are described in detail in the following sections.

Selection of the concept and determining the aim of the analysis

Based on the Walker and Avant's approach, the first and second steps of analysis include the selection of the concept for analysis and then determining the purpose of the analysis. Early rehabilitation care in patients with TBI has not been clearly stated in the literature; there is also no clear information about the specific activities that are accepted as early rehabilitation care interventions. Given that the concept of early rehabilitation care in TBI is new, it is also vastly applicable for health-related studies on providing services, making decisions, and policies. In addition, there are several new definitions and expressions regarding the operationalization of early rehabilitation care. Nonetheless, this concept remains unclear and there are likely gaps in the literature regarding the concept of early rehabilitation care among patients with TBI. In the present study, therefore, the researchers aimed to clarify the concept of early rehabilitation care in TBI to decrease the uncertainties, which can lead to an integrated understanding of the concept and its application.

Application of the Concept

Defining the terms is the first step in concept analysis. The term "early rehabilitation care" contains two separate phrases of "rehabilitation care" and "early". Oxford English Dictionary defines "rehabilitation" as 1) reviving a patient's health or normal life through training and care after surgery, addiction or imprisonment; 2) bringing back the patient's

advantages and fame; 3) helping the patient regain his/her previous status. It is also noteworthy that this word is traced back to medieval times. In addition, the term "early" is defined as 1) before the usual or expected time; and 2) close to a specific time or period by Oxford dictionary.²⁰ The term "rehabilitation medicine" was first used in the 1950s at the University of Pennsylvania. Andrea A. Conti, in his seminal article, defined "rehabilitation" as a purposeful process to promote and facilitate the improvement and cure after physical, mental, or emotional injuries and diseases.²¹

The concept of "early rehabilitation care" was first coined in the 1970s. Ever since, there has been a growing trend for scientific studies and discussions regarding this concept in a variety of disciplines like rehabilitation, nursing, occupational therapy, physiotherapy, etc.²² For instance, early rehabilitation care that was applied for animal studies concerning early training (granting freedom to the animal) and enriching the case environment (the presence of other materials in the context) was proved effective on their functional improvement.²³

In some studies, early mobilization and early rehabilitation are used interchangeably. In this case, these two concepts can only consider the physical aspect of rehabilitation.²⁴ Early rehabilitation is a kind of movement, which is safe and feasible.²⁵

Determination of the Defining Attributes

This is the most important step in concept analysis. The distinctive features of a concept provide further information about that concept and make it easier to distinguish the concepts from each other. These features have been repeatedly stated in a variety of resources regarding that concept.¹⁹

Having reviewed the related literature on early rehabilitation care in patients with traumatic brain injury, the researchers identified the three attributes of early rehabilitation care including early specialized comprehensive care, purposeful and patient-centered care, and teamwork accordingly.⁷

Early specialized comprehensive care

Traumatic brain injury includes a wide range of movement, cognitive, behavioral, emotional, and medical problems that require comprehensive care at all the physical, cognitive, and psychological aspects.⁷ The previous studies and the related resources reported that cognitive rehabilitation care that begins right after the TBI can facilitate and accelerate the

recovery process and can also reduce functional disability.²⁶ According to the literature, early specialized comprehensive care can improve the outcomes in patients with TBI and early interventions can contribute to better functional indexes and shorter hospital stay.^{9,27} It is believed that even slight delays in comprehensive rehabilitation care may cause negative effects on functional outcomes among patients with TBI.²⁸

Early rehabilitation care starts from the early moments after the incident and continues in the local level-I trauma hospitals that may last up to 35 days.²⁸ It generally begins when the patients' medical conditions are stable.²⁹

It is an integral part of the process of rehabilitation and treatment in the acute phase that can also facilitate the other rehabilitation interventions.²⁹ Appropriate early rehabilitation care can lead to the optimization of early neuroplasticity changes, which consequently leads to an improved recovery process.²⁶

Purposeful and patient-centered care

Early rehabilitation care is purposeful and patient-centered in nature. Patients' satisfaction with treatment, adherence to treatment, and higher diagnostic accuracy are among the positive outcomes of providing patient-centered care (PCC).³⁰

It is also believed that early rehabilitation care includes moving the patient from the intensive care unit (ICU), weaning from mechanical ventilation, constant monitoring of vital signs, and also utilizing venous or arterial lines.

The purposes of early rehabilitation care are: reducing the consequences of immobility, contracture, bladder and gastrointestinal functioning abnormality, pressure ulcer, and sleeping disorders, facilitating neuronal reorganization and recovery of body functions.²⁵ Early rehabilitation care strategies include: movement practice in bed, moving to a chair, walking, and performing daily activities. If the patients are reported to have functioning limitations and/or severe cognitive problems, they may be asked to conduct additional activities such as physical practice within their range of motion, using a brace and other neural-muscular electronic stimuli.²⁵

Teamwork process

Early rehabilitation care is a process that needs multidisciplinary and consultative teamwork. The rehabilitation team includes intensivists, neurologists, physiotherapists, occupational therapists, physicians, psychologists, speech therapists, social workers,

neuropsychologists, vocational counselors, rehabilitation optometrist, and nurses. The positive effects of early rehabilitation care can be observed only when it is done by a team of experts and on a regular basis. Previous studies have reported that early rehabilitation care for patients with TBI can reduce the costs as well.^{9,31} Besides, the teamwork process aims to recuperate patients' effective functioning at home, workplace, and society.⁹

Successful early rehabilitation care relies on the patient's cooperation, appropriate functioning of the cardiovascular system, and stability of the medical conditions, which altogether result in an improvement in outcomes.^{27,32}

Model Case

According to the Walker and Avant approach, a model case encompasses all the crucial attributes of the concept and provides an appropriate example of the target concept.¹⁷ The following is an example of the concept of early rehabilitation care in TBI patients:

Patient A is a 26-year old single Iranian man who was involved in a road traffic injury with a motorcycle and suffered multiple traumas. He had a basilar skull and right arm fracture. Right away after the accident, he was dispatched to the closest trauma hospital by EMS. After reviewing primary assessment and conducting Clinical and Para-clinical diagnostics, a neurosurgeon and an orthopedic surgeon performed surgeries on the patient, simultaneously. After surgery, the patient, while being intubated, was sent to the ICU. Because of the trauma and brain bleeding, the patient was in a coma for over a week and he was receiving mechanical ventilation. As soon as the patient was in a stable condition, the rehabilitation process began. The rehabilitation in physiotherapy included conducting a range of motion exercises, neural stimulations using electronic waves, chest physiotherapy, bladder training as well as taking medicine. With the patient regaining his consciousness, recovering from movement difficulties due to brain injury, and being extubated, the process of speech therapy began. During the hospitalization period, the Nursing Assistant would help change the patient's position every three hours and he was also observed by a nurse for any possible wound in order to avoid pressure ulcers. The patient was moved from the ICU to the surgery section. Then, all the rehabilitation interventions were conducted including helping the patient to walk using a walker, speech therapy, occupational therapy, etc. After one month of early

rehabilitation care, while he was in good condition and was able to take care of himself, the patient was sent home with his own consent. The patient came to the hospital to follow his treatment process one month after discharge.

This model case represents all the three attributes of early specialized comprehensive care, purposeful and patient-centered care, and teamwork process for early rehabilitation care in patients with TBI. In this model case, rehabilitation care begins right after that the patient's condition remained stable. Therefore, it is proposed to design such care based on the needs of the patient including quick weaning from a ventilator, changing the bed position, receiving bladder training, and stimulation of the nerves. These actions were provided by a specialized team of various disciplines, which led to quick recovery and discharge of the patient.

Borderline Case

A borderline case includes most of the defining attributes of a concept. Identifying the borderline cases will help clarify the distinctive features of a concept; hence, there will be less ambiguity regarding the borderlines of the concepts.^{17,19}

Patient B is a woman who had a car accident and injured her head. She was sent to the closest trauma center wearing a cervical collar because of the risk of spinal injury. As she was partly unconscious and there were multiple fractures, the patient was hospitalized in the ICU. Because of her unstable conditions and increased intracranial pressure (ICP), it was not possible to start early rehabilitation care right away. However, the team of experts decided to conduct some of the necessary rehabilitation care such as changing positions to avoid pressure ulcers and contractures, mouth care, and Foley and catheter care.

Finally, it is concluded that only two attributes of rehabilitation care were observed in this borderline case including teamwork and purposefulness. Nevertheless, providing early rehabilitation care was not recommended because of the patient's unstable condition.

Contrary Case

These cases include none of the features of our target concept. They help us identify what our target concept would not look like and clearly what the concept is not. They are quite clear and easy to distinguish in this sense.¹⁹

Patient C was a man suffering from left side hemiplegia and speaking disorder. He entered a community-based rehabilitation center in Shahre-Rey. He had had a cerebrovascular accident (CVA) six months ago, which led to

brain damage and he was hospitalized for one month, consequently. Due to the lack of specialized rehabilitation care, the patient was suffering from swallowing problems, speaking difficulty, heterotrophic ossification, hemiplegia, inability to walk with a walker, and contracture. Since his rehabilitation care process started with a six-month delay in society, he would have to bare long-term difficulties. Clearly, it is an instance of a contrary case that includes none of the target concept attributes. Patient C is under CVA and receives rehabilitation care after six months, which resulted in long-term adverse consequences. This example doesn't include any of the attributes of the concept; so, it is considered a contrary case model.

Antecedents

Antecedents are events and/or conditions that occur before the appearance of the concept.¹⁹ The antecedents of early rehabilitation care include the stability of vital signs, ICP, and cerebral perfusion pressure; moving the patient to the early rehabilitation care section; moderate and severe brain injury and disability. Moreover, it encompasses a multi-disciplinary team of experts who implement educational and problem-based procedures to help attain the highest functioning levels such as health assessment, rehabilitation care, goal setting and evaluation; and patient-centered and participated nature.

Consequences

Consequences are the results of the concepts.¹⁹ According to the findings of this analysis, the consequences of early rehabilitation care are classified into three categories of improved functional status, autonomy and community integration and prevented immobility complications. The consequences regarding improved functional status include treatment and revival of brain functions, better reorganization of neural system and functional duties, fewer probable disorders, vision rehabilitation, and better functioning of the patient when discharged.^{33,31} The consequences regarding autonomy and community integration consist of helping the patient return to the society, workplace, having better functional behavior, and regaining independency.²⁷ The consequences regarding the prevention of immobility complications include pressure ulcer, heterotopic ossification, contracture, and long-term disability. [Figure-1](#) shows the attributes, antecedents and consequences of the concept of early rehabilitation care for patients with TBI.

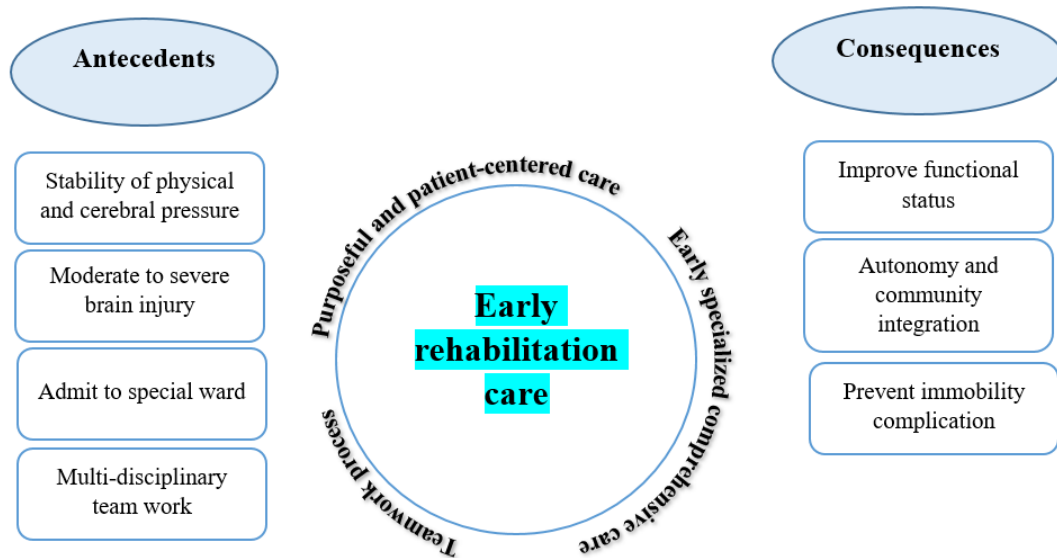


Figure 1: Attributes, antecedents, and consequences of the concept of early rehabilitation care

Empirical Referents

The final step in concept analysis includes the definition of empirical referents regarding the target concept. Empirical referents are tangible and measurable methods to show the occurrence of a concept. They include some real events indicating the occurrence of that concept. Empirical referents are in line with the theoretical basis of the concept, so they lead to both content and construct validity.¹⁷

The literature review showed that there is no specific instrument to measure early rehabilitation care. However, there are various scales to measure disability and outcomes after TBI such as Glasgow Coma Scale (GCS), Functional Independence Measurement (FIM), Glasgow Outcome Scale (GOS), Disability Rating Scale (DRS), Community Integration Questionnaire (CIQ), Quality of Life after Brain Injury (QOLIBRI), and the Functional Status Examination (FSE).³⁴ These scales are used to evaluate the physical and cognitive impairment-induced disability. However, a specific instrument is needed to measure early rehabilitation care in patients with TBI.

Discussion

Applying the Walker and Avant's systematic approach toward analysis of the concept of early rehabilitation care helps the researchers achieve a more specific and distinct description of the target concept through forming sample, relevant, borderline, and opposite cases. According to our analysis, the main features of early rehabilitation care included multi-disciplinary, inter-disciplinary, and

specialized treatment provided in level-I trauma clinics right after the injury. The purpose of early rehabilitation care is to avoid future side effects. The interventions include maximizing respiratory function and tracheostomy management, managing swallowing disorders, maintaining appropriate nutrition and hydration, avoiding contracture and pressure ulcers via changing the position of the patient throughout the process. In addition, they encompass effective management of urinary and GI systems, communication, seizure control, as well as providing information, consultant, and support for their family members.

Defining a concept is the starting point for a long-term and complementary process, which may lead to the formation of theories.¹⁹ At the moment, there has been no integrated and thorough theory regarding early rehabilitation care.

Rehabilitation is considered the closest concept that has very much in common with the concept of early rehabilitation care in patients with TBI. However, the two concepts are not synonymous. Rehabilitation as a concept is used in a variety of diseases, such as brain stroke, heart attack, and multiple sclerosis (MS). In a seminal work by Sally Margaret Davis, the concept of rehabilitation was defined as including multi-disciplinary teamwork, process-orientation, goal-setting, enablement, meaningfulness, and restoration. Such merits are well consistent with the characteristics of early rehabilitation care, yet they are different in the starting point of the rehabilitation care and the fact that these interventions are specific to the patients with TBI.³⁵

Based on Sally Margaret Davis' study, rehabilitation is considered a long-term process including different phases, which take place within different levels and at different places. She further argued that the rehabilitation process includes analysis, goal setting, interventions, and evaluation. Rehabilitation can be applied in acute care sections, rehabilitation sections, and/or in society. Early rehabilitation care is applied in acute care sections and most often in ICUs.³⁵

Whyte claimed that theories play a more important role than the mere "limiting role in clinical trial studies". He stated that the theories can be considered as general ideas capable of relying on limited empirical findings and, at the same time, "proposing more evidence". Whyte also believed that it might be impossible to develop an integrated and generally accepted theory for rehabilitation.³⁶

Reinhardy and Stucki designed a theoretical model for rehabilitation that can be applied for a wide range of studies "from elementary levels to professional levels". This cyclical model encompasses a central core called rehabilitation sciences which includes physiotherapy, speech therapy, and rehabilitation medicine. This core element is encircled by synthetic rehabilitation sciences which are confined by human behavioral sciences. Each circle is surrounded by three bars of biomedical, personal and environmental aspects.³⁷

It is noteworthy that, surprisingly, there has been no integrated theory to support rehabilitation care. The only two rehabilitation-related theories are treatment and enablement theories.³⁶

Although in this systematic and purposeful study, one of the limitations might be attributed to the fact that this is a new concept and there are very few related articles in the literature. It is suggested to use a hybrid approach to develop this concept, too. The concept will be better defined and described if more data are available for the researchers. However, the concept analysis can be further developed until the new knowledge or experiences are introduced.

Conclusions

This study aimed to analyze the concept of early rehabilitation care in patients with TBI. Early rehabilitation care is an interdisciplinary, specialized, consultative and exclusive treatment, which is available in acute care centers and ICUs. It involves interventions that are necessary to

receive right after the injury aiming at avoiding disabling complications. Evidence shows that if received in time, early rehabilitation care can help traumatic brain-injured patients recover and improve their mental functioning and expedite the patient's return to home, workplace and society. Moreover, it reduces the patient's stay in the ICU and reduces hospital stay as well. Therefore, it helps reduce healthcare costs. In addition, applying the rehabilitation process can lead to a higher quality of life, the patient's contribution to society, independence, and higher motivation in patient.

In the present study, a variety of resources were used to analyze the concept of early rehabilitation care and determine its features, antecedents, and consequences. Since the concept of early rehabilitation care has not been fully developed and introduced and there are only some primary efforts to put it into action, the present concept analysis can pave the way for further extensive quantitative, qualitative, and/or mixed-method studies. In this study, clarifying the concept helps determine the barriers, facilitators, and functional antecedents. It is also recommended for further studies to develop appropriate instruments, and then to measure the concept of early rehabilitation care for patients with TBI.

Acknowledgments

The researchers express their sincere appreciation and gratitude to the corresponding faculty and the central library of University of Social Welfare and Rehabilitation Sciences.

Authors' Contribution

HK: Conceptualization, Methodology, Supervision, Writing-original draft. ME: Conceptualization, Investigation, Writing-original draft. SAH: Resources, Investigation, Validation, Writing-review & editing. RMV: Resources, Investigation, Validation, Writing review & editing. AE: Methodology, Writing-review & editing, Validation.

Conflict of Interests

None.

Funding/Support

This article is extracted from a PhD dissertation submitted to University of Social Welfare and Rehabilitation Sciences through the following code: ir.uswr.rec.1396.215. The project was conducted with the financial help of the research deputy of the University

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